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(19)



(54) "COMPACTING GRASS AND LIKE FEED MATERIAL"

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the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to compacting grass and like feed material.

There is a need in agriculture for satisfactory means of packaging and storing grass and like agricultural feed materials. The current practice with grass storage is for the chopped grass to be pelleted and thereafter stored for example in silos. The pelleting and subsequent storage steps involve expensive equipment and increase the overall cost.

According to our invention, we provide a method of compacting grass and like agricultural feed material, in which the chopped grass or like feed material is fed into an enclosure in which the grass is compacted between a ram head and a pressure plate, the ram head being reciprocable within the enclosure which acts as a cylinder therefore and the ram head having a baffle plate attached thereto adapted to gradually mask the supply of feed material during forward travel of the ram head, and the pressure plate being retractable to allow each successive compacted pack of grass or like feed material to be ejected from the enclosure.

It is an optional feature of the invention that, for example, when chopped grass is employed as the agricultural feed material, this is mixed with an agriculturally acceptable binder which is also consumed as a food, for example, a sufficient amount of molasses to provide adhesion between the portions of chopped grass. The molasses helps to cut down undue expansion. The preferred proportion of molasses is from 10 to 30% by weight and 20% is particularly advantageous.

Agriculturally acceptable binders with no food values such as clays may be used instead of molasses but these are less desirable.

The compacted bale of grass or like feed material may be ejected from the enclosure into a bag whose mouth has been positioned and secured at the exit of the enclosure.

Apparatus for carrying out this method may comprise a tubular enclosure with a piston member having a ram head reciprocable within the enclosure, a baffle plate attached to the ram head and adapted to gradually mask the supply of feed material during forward travel of the head so as to completely cut off the supply at a particular forward position, and at the outlet end of the enclosure, a pressure plate against which the material within the enclosure is compacted during forward travel of the piston head within the enclosure, the pressure plate being displaceable in a plane at right-angles to the axis of the enclosure so that, in one end position of the pressure plate, the outlet end of the enclosure is fully masked and, in the other end position of the pressure plate, the outlet is free for ejection of a compacted bale of grass or like feed material from the enclosure. The movements of the reciprocable piston and of the retractable pressure plate which acts as a gate for the outlet end of the enclosure are co-ordinated so that the pressure plate remains in its masking position whilst material is fed into the enclosure and progressively compacted therein by the piston member, the pressure plate is fully retracted to allow ejection when a pack of desired length and compactness has been formed behind the pressure plate, thereby allowing ejection of the pack by forward travel of this piston and finally the

pressure plate is returned to its masking position whilst the piston is similarly being returned to its retracted position at which further feed of material to the enclosure takes place to form the immediately succeeding bale. This sequence of operations is repeated in continuous manner.

Reference is now made to the accompanying drawings, in which:

Fig. 1 is a sectional side-elevation of one embodiment of an apparatus according to the invention for packaging grass;

Fig. 2 is a plan view on the section II-II;

Fig. 3 is a corresponding end-view; and

Fig. 4 is a section on the line IV-IV.

The illustrated apparatus comprises a tubular shell 1 of oblong cross-section (see Fig. 3) which is supported on a girder framework generally indicated at 2 so as to be inclined to the horizontal. By oblong we mean that the shell is of flattened shape, having distinct upper and lower faces 3 and 4, respectively which are identical to, and parallel with, one another. The width dimensions are three to four times greater than the height of the shell 1. The top and bottom faces 3, 4 are generally rectangular and the side faces 5 are arcuate or part cylindrical and again identical with one another.

The tubular shell 1 is surmounted by a vertical tower hopper 6 with a feed device generally indicated at 7 at its upper end. The lower end 8 of the hopper 6 feeds into the top face 3 of the shell at about the middle 9 of the length of the shell. The girder framework comprises two pairs of legs, the rear legs 11 being substantially taller than the front legs 12 so as to maintain the inclination of the shell 1 downwardly towards the front end 23 thereof. The rear legs 11 support the shell 1 *via* a horizontal girder 13 which extends on each side beyond the shell 1 and is fixed at its ends to the legs 11, so as to give greater stability to the apparatus as a whole.

The rear portion 14 of the inclined shell carries within it a double acting hydraulic ram 15. The dimensions of the ram head 16 and of the inside walls 17 of the shell 1 ensure a sliding fit between the outside surface of the head 16 and the inside walls of the shell. The ram cylinder 18 extends within the shell over about one-half of the length of the shell, and the ram stem 19 extends within its cylinder over substantially the entire length thereof. Oil fed at 20 into the cylinder 18 acts on a back-plate 21 at the rear end of the stem to actuate the ram 15. The ram 15, is provided with a variable pressure relief valve (not shown) and a pressure guage (not shown).

A substantially rectangular pressure plate 22 is located at the front outlet end 23 of the shell 1. The plate 22 is displaceable in a plane at right angles to the axis 24 of the shell 1 so as to mask the outlet end 23 of the shell entirely in the lower end position of the pressure plate 22 and to disclose the outlet end 23 in the upper end position of the plate 22. The shell is extended beyond the outlet end 23 and the plate 22, which acts as a gate, by a nose 25 for receiving the mouths of bags into which baled material is ejected. The ram 15 extends slightly beyond the pressure plate 22 when in its fully extended position.

The feed device 7 at the upper end of the hopper 6 comprises a pair of unlined steel rollers 26 of approximately 12" diameter which lie side by side with parallel axes 27 extending in the same direction as the axis 24 of the shell but horizontal instead of inclined to the horizontal. The cylinders 26 contact one another to form a feed nip 28 for grass and binder material located on the axis 29 of the vertical hopper. The cylinders 26 are driven by a variable speed drive 31.

We prefer, however, to use for the feed device 7 a conventional auger (not shown) mounted in cantilever manner to avoid build-up around an end-bearing. As grass is discharged from the conveyor of the grass drier into the auger, it passes through a curtain formed by discharging molasses through a perforated pipe (not shown).

The pressure plate 22 at the front end of the shell 1 is actuated by a piston-cylinder mechanism 32 extending in the same plane as the plate 22. The bottom end 8 of the hopper 6 opens directly into the shell at 9. The rear wall 33 of the hopper 6 relatively to the shell coincides with the front face 34 of the ram head 16 in its fully retracted position so that when the ram 15 is fully retraced the feed of material into the shell 1 is unhindered. A screen 35 is carried on the top side of the ram which, during forward travel of the ram 15, gradually masks the supply of material from the tower hopper 6, eventually completely masking the hopper outlet 8 into the shell opening 9 when the ram head 16 has reached a position corresponding to the front wall 36 of the hopper.

The movements of the pressure plate 22 at the outlet end 23 of the shell and of the compacting ram 15 are co-ordinated as will be explained below.

Although tests have been carried out on apparatus comprising a shell of one quarter inch mild steel, it is contemplated that the shell will normally be made of stainless steel so as to protect it from corrosion by grass and like material.

Manual controls (not shown) are provided by a first spool valve for the ram 15 and a second spool valve for the pressure plate 22.

The apparatus described above operates as follows.

Grass which has been chopped to an average fibre length of two to three inches and dried in a conventional drier (not shown)

is fed to the auger constituting the preferred feed device 7 referred to above. The chopped grass feed is combined with a proportion of molasses to act as a binder at the inlet to the auger.

Grass and binder together fall vertically down the hopper 6 directly into the inclined shell 1, the ram 15 being in its fully retracted position (as shown) at that time and the pressure plate 22 being in its lower end position (as shown). Material collects within the shell 1, and the ram 15 compacts this material against the pressure plate 22 by forward travel. The ram is retracted and travels forward several times to compact further amounts of material into the pack which is being formed. It will be appreciated that the pressure within the ram cylinder 18 is such that as material is built up against the pressure plate 22, the length of forward travel of the ram can be controlled simply by the resistance exerted by the build-up of material to forward movement of the ram 15. When compacted pack of predetermined length and compactness has been formed, the relief valve is actuated interrupting the ram. The pressure plate 22 is then upwardly retracted and the ram is thereafter actuated for forward travel to eject the completed pack into a bag whose mouth has been positioned and secured, over the nose extension 25 of the shell 1. The ram 15 is returned to its retracted position, and the pressure plate 27 is returned by its supporting piston 32 to its lower blocking position. The apparatus is then ready to receive and to compact further material into the packs.

It will be appreciated that, during forward movement of the ram head 16, the shield 35 attached to the top of the ram cuts off the supply of grass by masking the outlet 8 from the hopper 6, and at the end of the return stroke of the ram 15, the shield 35 again unmasks the hopper outlet allowing the next charge of grass to fall into the chamber.

Although at present most of our tests have been carried out with molasses, we may use other binding agents which are acceptable in the animal foodstuff industry but at present we find molasses the most effective and economical binding agent and it also has a high energy content to add to the grass material. Similarly, although the invention has been particularly described with described with reference to grass feed, other animal food materials such as chopped straw and various forms of silage may be employed. Whole crop cereals cut to a required length, e.g. barley, may be packaged according to the invention.

In the case of hay, a naturally dried material may be used, and the drier referred to above may be omitted.

WHAT WE CLAIM IS:-

1. A method of compacting grass and like agricultural feed material, in which the chopped grass or like feed material is fed into an enclosure in which the grass is compacted between a ram head and a pressure plate, the ram head being reciprocable within the enclosure which acts as a cylinder therefore and the ram head having a baffle plate attached thereto adapted to gradually mask the supply of feed material during forward travel of the ram head, and the pressure plate being retractable to allow each successive compacted bale of grass or like feed material to be ejected from the enclosure.

2. A method according to claim 1, in which chopped grass is mixed with an agriculturally acceptable binder constituting an animal feed.

3. A method according to claim 2, in which molasses is employed as the binder.

4. A method according to any of claims 1 to 3 in which the movements of a reciprocable piston member to which the ramhead is attached and the retractable pressure plate, which acts as a gate for the outlet end of the enclosure, are co-ordinated so that (i) the pressure plate remains in its masking position whilst material fed into the enclosure is progressively compacted therein by the piston member; (ii) the pressure plate is fully retracted to allow ejection by the ram of a pack of desired length and compactness which has been formed behind the pressure plate; and (iii) the piston member is returned to its retracted position and the pressure plate is returned to its masking position the sequence of operations being repeated in continuous manner.

5. A method according to any of claims 1 to 4, in which the compacted bale of grass or like feed material is ejected from the enclosure into a bag whose mouth has been positioned and secured at the exit of the enclosure.

6. A method according to claim 1 substantially as herein described with reference to the accompanying drawings.

7. An apparatus for compacting grass and like feed material comprising a tubular enclosure with a piston member having a ram head reciprocable within the enclosure, a baffle plate attached to the ram head and adapted to gradually mask the supply of feed material during forward travel of the head so as to complete cut off the supply at a particular forward position, and at the outlet end of the enclosure, a pressure plate against which the material within the enclosure is compacted during forward travel of the piston head within the enclosure, the pressure plate being displaceable in a plane at right-angles to the axis of the enclosure so that, in one end position of the pressure plate, the outlet end of the enclosure is fully masked and, in the other end position of the

pressure plate, the outlet is free for ejection of a compacted bale of grass or like feed material from the enclosure.

8. Apparatus according to claim 7 substantially as herein described with reference to the accompanying drawings.

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1420213 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

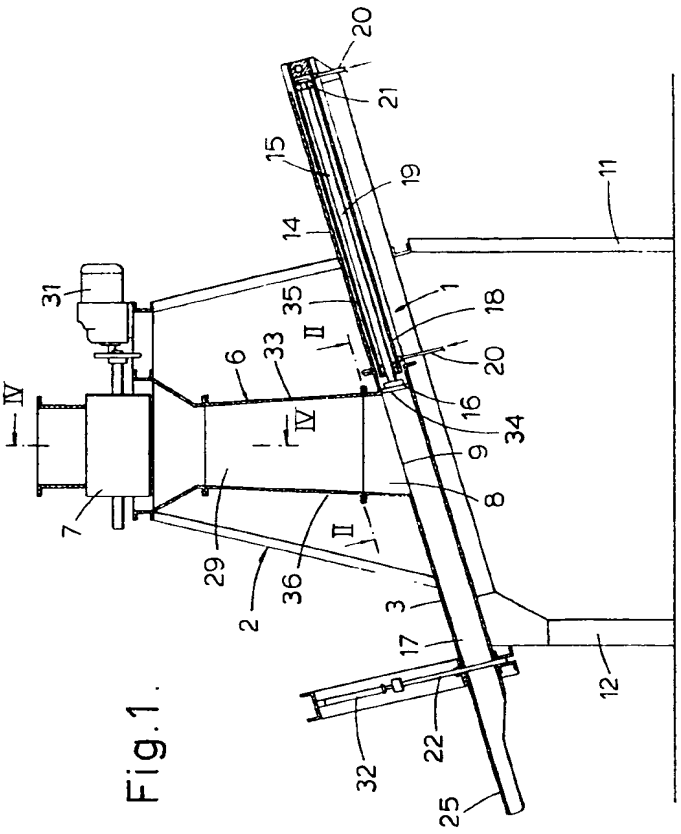


Fig.1.

1420213 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 2

Fig. 2.

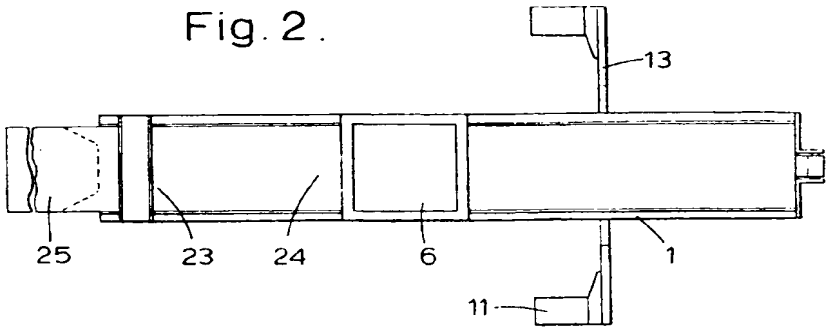


Fig. 3.

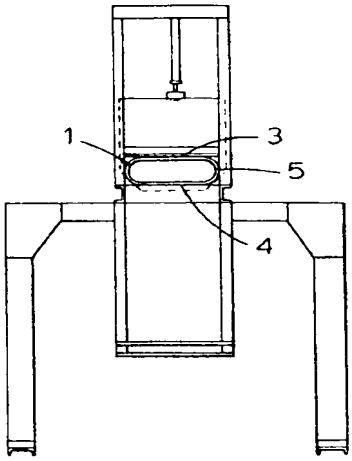


Fig. 4.

